

Udaya subsimilis, a New Generic Combination, a
Redescription of the Holotype, and Notes on
the Genus Udaya (Diptera: Culicidae)

John F. Reinert^{1, 2}

ABSTRACT. The holotype male of Finlaya subsimilis Barraud is redescribed and the adult and genitalia are illustrated. This species is transferred to the genus Udaya Thurman from Aedes (Finlaya). Distinguishing adult features of the genus Udaya are discussed.

INTRODUCTION

Udaya subsimilis was originally described by Barraud (1927: 552) in the genus Finlaya Theobald from an unique male collected from North Bengal, India. Edwards (1932: 152) included this species in the subgenus Finlaya of the genus Aedes Meigen. Edwards' generic and subgeneric arrangement has been followed by all subsequent authors which have treated subsimilis. During revisionary studies on Finlaya I discovered that subsimilis did not belong to this subgenus but was a typical Udaya Thurman and was similar in the adult habitus and male genitalia to Ud. argyrurus (Edwards). Udaya subsimilis is currently represented by the holotype male which is redescribed and illustrated below.

Nomenclature used in the description and illustrations of the adult and male genitalia follows Harbach and Knight [1980, 1981 (1982)]. In the synonymy and other sections the following symbols apply: M = male and * = portion of stage is illustrated.

¹Colonel, Medical Service Corps, Department of the Army, Office of the Surgeon General, ATTN: SGPS-PSP-E, 5109 Leesburg Pike, Falls Church, VA 22041-3258; and Consultant, Walter Reed Biosystematics Unit, Museum Support Center, Smithsonian Institution, Washington, DC 20560.

²The views of the author do not purport to reflect the positions of the Department of the Army or the Department of Defense.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 1989		2. REPORT TYPE		3. DATES COVERED 00-00-1989 to 00-00-1989	
4. TITLE AND SUBTITLE Udaya subsimilis, a New Generic Combination, a Redescription of the Holotype, and Notes on the Genus Udaya (Diptera: Culicidae)				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Walter Reed Biosystematics Unit, Smithsonian Institution, Washington, DC, 20560				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT see report					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 10	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

UDAYA SUBSIMILIS (BARRAUD) NEW COMBINATION
(Figs. 1, 2)

Finlaya subsimilis Barraud 1927: 552 (M*).

Aedes (Finlaya) subsimilis of Edwards 1932: 152; Barraud 1934: 203 (M*); Knight 1948: 3; Knight and Marks 1952: 536; Stone, Knight and Starcke 1959: 171; Stone and Delfinado 1973: 300; Knight and Stone 1977: 105; Lu and Li 1982: 31.

MALE (Fig. 1). Head. Antennal pedicel dark, 2 small broad dark scales mesally, flagellomere 1 with small broad brown scales, setae in whorls directed mainly dorsally and ventrally, 0.7 length of proboscis; maxillary palpus narrow throughout entire length, scales dark brown except for a small basomesal white patch on palpomere 2 and a moderately broad basal white band on palpomere 3, palpomere 4 with 2 short dark setae on dorsoapical area, palpomere 5 with 4, 5 short dark setae at apex, overall length 0.94 of proboscis, individual palpomere lengths of total: 1 = 0.08, 2 = 0.20, 3 = 0.31, 4 = 0.25 and 5 = 0.16; proboscis with dark brown scales, apical portion slightly thickened and slightly downturned, 1.04 length of femur I; clypeus dark brown, bare; interocular space with a spoon-shaped patch of broad overlapping silvery scales extending ventrally between antennal pedicels, 2 very long dark interocular setae; 2 long dark ocular setae, one on each side of white-scaled patch, narrow ocular line with broad silvery scales; vertex covered with broad recumbent spatulate scales, moderately broad median area with scales blackish-brown, a stripe of silvery spatulate scales on each side and broad brown scales below on postgena; occiput with a few short blackish-brown erect forked scales on posterior area; eyes slightly separated in front. Thorax. Somewhat laterally compressed; scutum with cuticula reddish-brown, covered with closely aligned narrow reddish-brown scales except for a few golden-brown scales on anterior promontory area, anterior margin of dorsocentral areas and along lateral margins of bare prescutellar area, dark setae on following areas: 2 on anterior promontory, 6, 7 on anterior scutal fossal, one lateral scutal fossal, dorsocentral with one on anterior portion and one long one at posteromedial juncture of scutal fossal suture, a patch of short black supraalar setae anterior to wing base and followed caudally by long reddish-brown setae, several long prescutellar, and one parascutellar; scutellum with a patch of blackish-brown broad spatulate scales on each lobe, midlobe with 4 long and 3 short dark setae, lateral lobes with 3 long and 3 short dark setae; mesopostnotum bare; pleural cuticula reddish-brown; anteprenotum with a large patch of broad overlapping silvery scales on posterior margin and separating 3 long dark setae on anterior dorsal area from 3 long and one short dark setae on anterior median area; postpronotum without scales, 4 dark posterior setae; proepisternum with a patch of broad overlapping silvery scales and 8 dark setae on upper area, lower area bare; postspiracular area without scales, 3 dark setae; paratergite

covered with broad overlapping silvery scales; mesokatepisternum with broad overlapping silvery scales forming a small linear upper and a small lower posterior scale patch, one long upper, one median posterior and 4, 5 short lower dark setae; prealar knob with a few setae; mesepimeron with a small scale patch of broad overlapping silvery scales on upper area which continues the scale patch started on upper mesokatepisternum, 4, 5 short golden-brown setae on upper posterior area, lower setae absent; subspiracular, hypostigmal, mesomerall and metamerall areas bare.

Legs. Coxae I-III each with several golden or brown setae and a patch of broad white scales on anterior areas, I also with a patch of golden-brown scales on median area posterior to white scales on anterior margin; trochanters I-III each with several short golden setae and a patch of dusty white scales; femur I with scales on anterior surface dark brown and with golden-brown scales along basal portion of dorsal margin and median area, apex with a small spot of white scales, posterior surface with scales dark brown and with a narrow dorsal longitudinal stripe of golden-brown scales from base to near apex, stripe broader basally, femur II with scales on anterior surface dark brown and with scales on ventral margin golden-brown from base to near apex, apex with a small spot of white scales, posterior surface with scales dark brown and with a broad ventral stripe of golden-brown scales from base to near apex, stripe narrower distally, femur III with anterior surface with scales dark brown and with a broad longitudinal stripe of golden-white scales ventrally from base to near apex, stripe slightly narrower distally, apex with a small spot of white scales, posterior surface similar to II except basal pale area with white scales; tibiae I-III each with scales dark brown but with scales on posterior surfaces golden-white with some brown scales intermixed on I and II; tarsi I and II with scales dark brown, I also with a small dorsobasal spot of white scales on tarsomeres 1 and 2, II also with a small dorsobasal spot of white scales on tarsomeres 1-3, tarsus III with scales dark brown with a moderately wide basal band of white scales on tarsomeres 1-3 and tarsomere 4 with white scales except for a very narrow apical band of brown scales; posttarsi each with 2 unguis, I with unguis unequal in size, larger one with a tooth, smaller one simple, II and III with unguis equal in size, both simple.

Wing. Dorsal and ventral veins dark-scaled; alula with a single row of moderately broad pale brown scales on margin; upper calypter without setae on margin; remigial setae absent.

Halter. Pedicel pale brown; capitellum with scales dark brown basally and with small broad white scales apically.

Abdomen. Terga I-VI with scales dark brown, II-VI also with a narrow dorsobasal band of light brown scales, I with a large patch of silvery scales covering laterotergite, II-VI each with a lateromedian moderate sized patch of silvery scales which do not reach basal margins; sterna II-VI with scales golden, V and VI also with a small posteromedian patch of brown scales, patch larger on VI; terga and sterna with a few short golden or brown setae, mostly along

lateral and posterior margins, setae on sterna V and VI somewhat longer; remainder of abdomen and genitalia previously removed and mounted on a microscope slide. Genitalia (Fig. 2). The genitalia were badly damaged and the parts poorly positioned in the original preparation, therefore this preparation was photographed prior to remounting. The illustration and description are based on both the original and remounted preparations and are a reconstruction of the genitalia. Tergum IX moderately pigmented, approximately uniform in depth throughout width, posterior margin nearly straight and with a short median notch, 7, 8 moderately long thin setae arranged in a double row along posterior area on each side of notch; gonocoxite moderately pigmented, moderately long and moderately wide, apical portion narrower, tergal surface with numerous moderately long and long stout setae on basal area, a patch of moderately long narrow lanceolate setae on mesal area between 0.25 and 0.40 from base, a dense patch of moderately long setae on mesal area from 0.46 to near apex and a few short thin setae on apical 0.07 distad of this patch, a more or less double row of very long stout setae on basal 0.73 of lateral area, lateral and ventral surfaces covered with broad spatulate scales, ventral surface with several short thin setae along mesal surface and a number of moderately long thin setae on remainder of area, those on apical approximately 0.35 longer; gonostylus long, approximately 0.6 length of gonocoxite, basal portion narrow and apical 0.39 expanded and then narrowed into a bluntly pointed apex, gonostylar claw a moderately long stout heavily pigmented spiniform, attached 0.07 from apex of gonostylus; basal mesal lobe consists of a short finger-like projection connected to basal mesal surface of gonocoxite, apical 0.5 free and bears a stout, heavily pigmented, short and pointed spiniform and 4, 5 short, very thin, subapical setae, surface covered with short spicules, lobe connected with its mate by a narrow basomesal band; proctiger with paraproct moderately long, heavily pigmented, apex produced into a stout blunt point, cercal setae absent; phallosome with aedeagus divided into 2 lateral plates each bearing several stout pointed teeth on apical 0.78 (similar to Type II aedeagus of Reinert 1973, Fig. 33), paramere 0.63 of aedeagal lateral plate length, basal piece moderately long and moderately wide; and sternum IX very long, median area heavily pigmented and with an apical patch of 5 moderately long stout and 7 short thin setae.

DISCUSSION

Thurman (1954: 84) described Udaya as a new subgenus of Aedes and separated it from Paraedes Edwards, where the type species argyrurus had been questionably placed by Edwards (1934: 448). Mattingly (1958: 79) elevated Udaya to generic rank and later included it in his keys to the genera of Culicidae (Mattingly 1971: 8). Currently three species are recognized in

Udaya, i.e., argyrurus, lucaris Macdonald and Mattingly, and subsimilis. Additional information on argyrurus can be found in Edwards (1934: 448), D. Thurman (1954: 84), E. Thurman (1959: 74) and Macdonald and Mattingly (1960: 26) and for lucaris in Macdonald and Mattingly (1960: 22).

Udaya is characterized in the adult by: development of the male maxillary palpus (similar to subsimilis described above); vertex with broad recumbent scales; spoon-shaped patch of broad overlapping silvery scales on interocular area which extends ventrad between antennal pedicels; scutum covered with closely aligned narrow scales; thorax laterally compressed; few dorsocentral setae; acrostichal setae absent; antepnotum with a patch of broad overlapping silvery scales separating setae into two patches; postpronotum, subspiracular and postspiracular areas without scales; paratergite with a patch of broad overlapping silvery scales; upper calypter of wing without or with only a few setae; tarsus III with basal white-scaled bands on tarsomeres I-IV, band on IV large and covers entire area except for a small dark-scaled apical ring; male posttarsus II with ungues equal in size and simple; abdominal sterna with scales golden except for a small posteromedian area of brown scales on last two or three sterna; and features of the male genitalia (i.e., sternum IX very large and expanded cephalad, gonocoxite development and setal arrangement, gonostylus shape and claw shape, aedeagus with toothed lateral plates, and development of the basal mesal lobe, these features of the genitalia are similar to subsimilis described above).

Barraud (1927: 552) stated that subsimilis appeared to be related to Finlaya dissimilis (Leicester), but differed in the presence of white rings on the hind tarsus, the markings on the maxillary palpus, and in other details. Edwards (1932: 152) placed this species in Group F (Albotaeniatus Group) of Aedes (Finlaya) based on the pale markings on the legs and other features and indicated that the group included various more or less unrelated forms. Knight and Marks (1952: 536) in their treatment of Aedes (Finlaya) placed subsimilis in a monotypic Subgroup V of Group F (Alboannulatus Group) and stated that the group included a number of more or less unrelated subgroups. Based on the characteristic features of Udaya outlined above, subsimilis clearly belongs to this genus.

TYPE DATA

The holotype adult of subsimilis contains the following information on labels attached to the pin: Finlaya subsimilis Barraud, type male (white rectangular label); 1298 (collection number, small beige rectangular label); India: North Bengal, Sukuna, IX.1922, Capt. P. J. Barraud, B. M. 1927-93 (white rectangular label); HOLOTYPE (small circular white label with a

red border); and T89.18 (genitalia preparation number, small white rectangular label). The holotype male and genitalia (mounted in Canada balsam on a microscope slide) are deposited in the British Museum (Natural History) (BMNH). The adult is pinned through the side of the thorax with a minuten pin and secured to a small amber colored rectangular plastic stage attached to an insect pin.

BIONOMICS

Barraud (1927: 553) reported that the holotype was bred from a larva taken from a bamboo stump in September.

ACKNOWLEDGMENTS

Appreciation is expressed to: Ralph E. Harbach and E. L. Peyton, Walter Reed Biosystematic Unit, Smithsonian Institution, Washington, DC, for reviewing the manuscript; to Bruce Townsend, BMNH, London, United Kingdom, for the loan of the holotype; James E. Pecor, WRBU, for the loan of specimens; and Taina R. Litwak, WRBU, for preparing the illustrations.

LITERATURE CITED

- Barraud, P. J. 1927. A revision of the culicine mosquitoes of India, Part XXI. Descriptions of new species of Aedimorphus and Finlaya, and notes on Stegomyia albolineata (Theo.). Indian J. Med. Res. 14: 549-554.
- Barraud, P. J. 1934. The fauna of British India, including Ceylon and Burma. Diptera V, Family Culicidae. Tribes Megarhinini and Culicini. Taylor and Francis, London, 463 pp.
- Edwards, F. W. 1932. Diptera, Fam. Culicidae. In P. Wytsman, Genera Insectorum. Desmet-Verteneuil, Brussels, Fasc. 194, 258 pp.
- Edwards, F. W. 1934. Appendix. In P. J. Barraud. The fauna of British India, including Ceylon and Burma. Diptera V, Family Culicidae. Tribes Megarhinini and Culicini. Taylor and Francis, London, pp. 427-453.
- Harbach, R. E. and K. L. Knight. 1980. Taxonomists' glossary of mosquito anatomy. Plexus Publishing, Inc., Marlton, New Jersey, 415 pp.
- Harbach, R. E. and K. L. Knight. 1981 (1982). Corrections and additions to Taxonomists' Glossary of Mosquito Anatomy. Mosq. Syst. 13: 201-217.

- Knight, K. L. 1948. The Aedes (Finlaya) albotaeniatus group of mosquitoes (Diptera, Culicidae). Proc. Entomol. Soc. Wash. 50: 1-8.
- Knight, K. L. and E. N. Marks. 1952. An annotated checklist of the mosquitoes of the subgenus Finlaya, Genus Aedes. Proc. U. S. Nat. Mus. 101 (3288): 513-574.
- Knight, K. L. and A. Stone. 1977. A catalog of the mosquitoes of the world (Diptera: Culicidae). Thomas Say Found., Entomol. Soc. Am., vol. VI, 611 pp.
- Lu, Baolin and Peisi Li. 1982. Chapter 1, Identification of Chinese mosquitoes. pp. 1-159, 941-944, In Baolin Lu, Ed., Handbook for the Identification of Chinese Important Medical Zoology, People's Hygiene Publ. House, People's Republic of China, 956 pp. (In Chinese).
- Macdonald, W. W. and P. F. Mattingly. 1960. A new species of Udaya from Malaya and a description of the early stages of U. argyrurus (Edwards, 1934) (Diptera: Culicidae). Proc. R. Entomol. Soc. London (B) 29: 22-28.
- Mattingly, P. F. 1958. A revision of Paraedes Edwards and Cancraedes Edwards (Diptera: Culicidae). Proc. R. Entomol. Soc. London (B) 27: 76-83.
- Mattingly, P. F. 1971. Contributions to the mosquito fauna of Southeast Asia. XII. Illustrated keys to the genera of Mosquitoes. Contrib. Am. Entomol. Inst. (Ann Arbor) 7(4): 1-84.
- Reinert, J. F. 1973. Contributions to the mosquito fauna of Southeast Asia. - XVI. Genus Aedes Meigen, subgenus Aedimorphus Theobald in Southeast Asia. Contrib. Am. Entomol. Inst. (Ann Arbor) 9(5): 1-218.
- Stone, A. and M. D. Delfinado. 1973. Family Culicidae. In A catalog of the Diptera of the Oriental Region. vol. I, pp. 266-343.
- Stone, A., K. L. Knight and H. Starcke. 1959. A synoptic catalog of the mosquitoes of the world (Diptera, Culicidae). Thomas Say Found., Entomol. Soc. Am., vol. VI, 358 pp.
- Thurman, D. C., Jr. 1954. The discovery of Paraedes (Udaya) argyrurus Edwards, 1934, in Thailand (Diptera: Culicidae). Mosq. News 14: 83-86.
- Thurman, E. H. B. 1959. A contribution to a revision of the Culicidae of northern Thailand. Univ. Maryland Agr. Exp. Sta. Bull. A-100, 177 pp. + index.

LIST OF FIGURES

Figure 1. Adult male.

Figure 2. Male genitalia.

FIGURE ABBREVIATIONS

Male Genitalia

Ae	= Aedeagus
BML	= Basal mesal lobe
BP	= Basal piece
Gc	= Gonocoxite
Gs	= Gonostylus

IX-S	= Sternum 9
IX-Te	= Tergum 9
Par	= Paramere
Pr	= Proctiger

Fig. 1

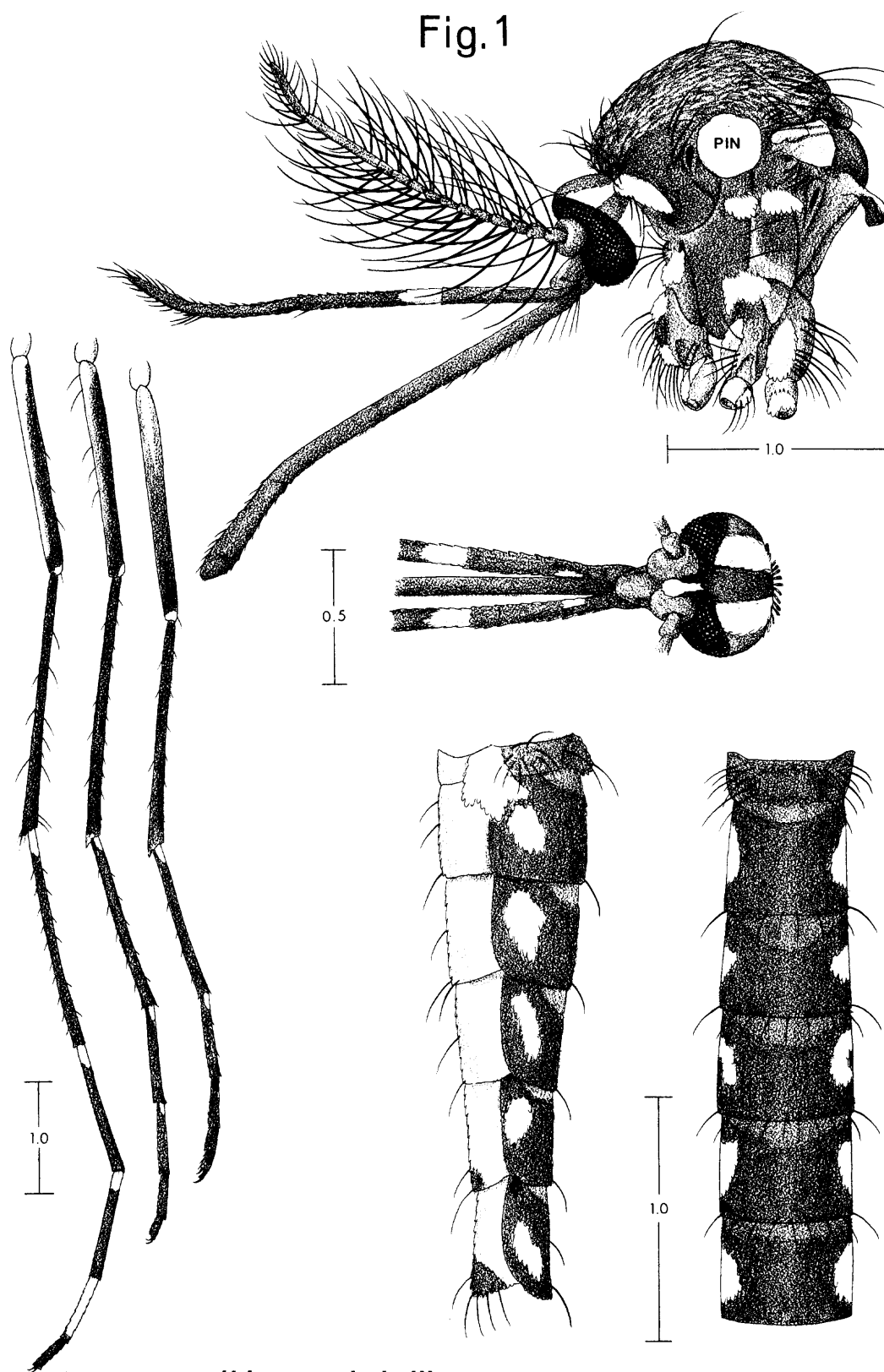
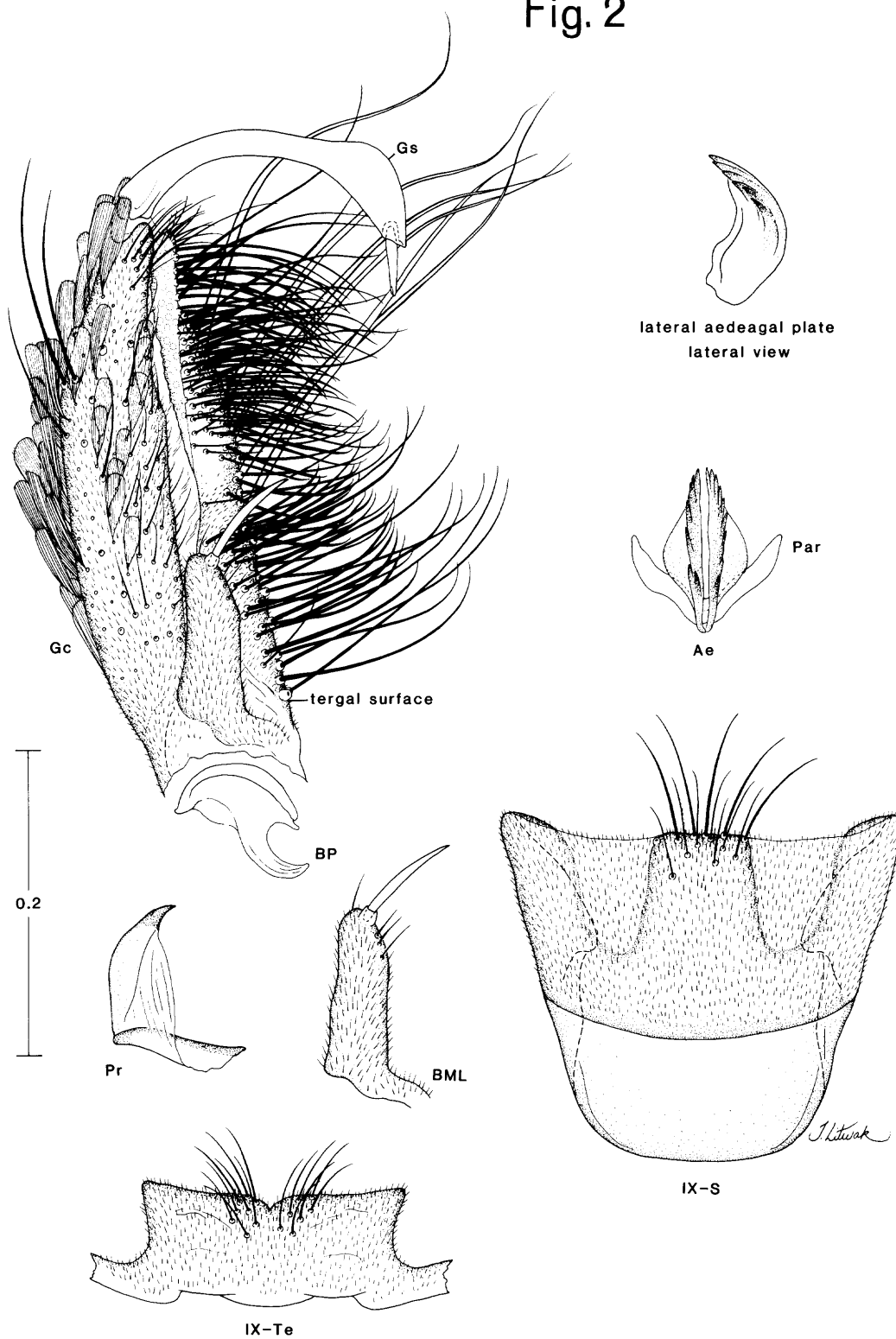
*Udaya subsimilis*

Fig. 2

*Udaya subsimilis*